gecad

Knowledge Engineering and Decision Support Research Group

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Project MAN-REM – Multi-agent Negotiation and Risk Management in Electricity Markets (PTDC/EEA-EEL/122988/2010), (FCOMP-01-0124-FEDER-021489) is recruiting 1 young researcher graduated in Computer Science/Informatics or similar, with solid background in the area of Power Systems. This call concerns research activity in the area of intelligent short term management of distributed energy resources in a multi-player competitive environment. This project is funded by Portuguese funds through FCT/MEC (PIDDAC) and co-funded by "Fundo Europeu de Desenvolvimento Regional" (FEDER) through COMPETE – "Programa Operacional Factores de Competitividade" (POFC). The following conditions are applied to this recruitment process:

1. SCIENTIFIC AREA

    Computer Science

2. EDUCATION

    Graduation in Computer Science / Informatics or similar.

3. DURATION

    From October 1, 2013 until 31, March 2014 (06 months duration, eventually to be renewed till 1 year).

4. ACTIVITIES AND WORKPAN

    Electricity markets (EMs) are systems for effecting the purchase and sale of electricity using supply and demand to set energy prices. Two key objectives of EMs are ensuring a secure and efficient operation and decreasing the cost of electricity utilization. To achieve these goals, three major models have been considered: pools, bilateral contracts, and hybrid models. Ideally, opening up the electrical power industry to competition would be an important tool to improve efficiency and benefit energy customers. Competitive forces would drive companies to innovate and operate in more efficient and economic ways. Innovation would lead to lower prices and better uses of energy resources. However, the analysis of important European electricity markets (e. g., the Iberian market involving Portugal and Spain) yields the main observation that they are still far from liberalized. Today there is still a lack of both theoretical and practical understanding and important challenges are still waiting to be addressed more thoroughly. Chief among these are the additional complexities to coordinate technical and economic issues, and the technical difficulties to understand EMs internal dynamics. Stated simply, tariffs do not reflect the pressure of competition. EM simulators can give important contributions to this problem and a number of prominent tools have been proposed. However, most energy management tools present limitations concerning the application field, i.e., they are tailored to specific market models and/or particular market operations.

    Multi-agent systems (MAS) represent a relatively new and rapidly expanding area of research and development. MAS can deal with complex dynamic interactions and support both Artificial Intelligence (AI) techniques and numerical algorithms. In this way, a multi-agent approach in which software agents are capable of flexible autonomous action in order to meet their design objectives is an ideal fit to the naturally distributed domain of a deregulated energy market. Accordingly, this project addresses the challenge of using software agents to help manage the complexity of EMs. Specifically, the overall goal of this project is to develop an EM simulator enabling market participants to: (i) Negotiate the terms of forward bilateral contracts, consider dynamic pricing tariffs (efficient management of DR), reach (near) Pareto-optimal agreements, and unilaterally de-commit from contracts by paying de-commitment penalties; (ii) Ally into beneficial coalitions - notably coalitions involving end-use customers - to achieve more powerful negotiation positions, and thus negotiate better tariffs; (iii) Manage a portfolio of customers, taking into account trade-offs between the risk and return of bilateral contracts – notably contracts involving traders and customers.

    Additionally, this project aims at integrating the EM simulator into the MASCEM system. The main expected result will be an improved energy management software tool able to simulate EMs in a complete and realistic way, thus overcoming most technical limitations of existing EM simulators.

    Finally, this project addresses the application of the energy management tool to the Iberian market. The consideration of a real problem will provide additional challenges, making the tool more powerful towards ensuring the full benefits of deregulation.

The candidate to be selected will participate in the following project tasks:

T3 – Virtual Players and Coalitions
T5 – Energy Management Software Tool

The selected candidate work includes:

- Implementation of a MAS simulator considering the developed models, methodologies and applications;
- Implementation of the MIBEL model in the developed tools;
- Design, implementation, test, and use of the energy management software tool;
- Preparation of case studies and result analysis concerning the test of the resulting energy management software tool;
- Technical reports and scientific papers preparation and writing.
This work includes the design of the foreseen methodologies, their implementation, and test.

5. LEGISLATION AND REGULATIONS

"Estatuto do Bolseiro de Investigação Científica", approved by Law no. 40/2004, of 18 August, modified and e republished by Decree-law no. 202/2012, of 27 August and modified by Decree-law no. 233/2012, of October and by Law no. 12/2013, of 29 January; Regulation no. 405/2010, May.6.2010 (published in "Diário da República" no. 88, II Serie, 06.May.2010) – "Regulamento de Bolsas de Formação Avançada do ISEP"; "Regulamento de Bolsas de Investigação da Fundação para a Ciência e a Tecnologia, I.P. – 2012.

6. SUPERVISION AND WORKPLACE

The candidate to be selected will be scientifically supervised by Professor Zita Vale.
The workplace is at GECAD – Knowledge Engineering and Decision Support Research Center in the following address:

Instituto Superior de Engenharia do Porto
Rua. Dr. António Bernardino de Almeida, 431
4200-072 Porto – Portugal

7. REMUNERATION

As defined by FCT (€ 745.00/month), according to the table of stipends of the country (available in http://www.fct.pt/apoios/bolsas/valores.phtml.en), paid by bank transfer).

8. CANDIDATE SELECTION METHODOLOGY AND EVALUATION PANEL

Only candidates that have presented the complete set of application documents and showing evidence of having the required minimum profile required will be admitted. The selection method will take into account the following components: BSc (20%) and MSc graduation classification (30%), curriculum vitae evaluation (50%). To clarify the candidates' motivation and profile, according to the fellowship requirements, an interview may be undertaken; it will be conducted in English. In this case, the following components will be taken into consideration: BSc graduation classification (25%), curriculum vitae evaluation (50%) and interview (25%).

The evaluation panel includes: Prof. Zita Maria Vale (panel coordinator), Prof. Goreti Marreiros and Prof. Praça**.**

9. RESULTS PUBLICATION AND NOTIFICATION

The candidates will be individually notified by email message on the final evaluation results.

10. APPLICATION

Minimum profile required: Solid background in artificial intelligence, modeling, simulation, multi-agent systems, and some experience in the power systems field. At least 1 year of experience in scientific research activities. Author of at least 1 scientific paper written in English. Writing and speaking proficiency in English.

Preferred profile: Previous work experience in research activities in the area of power systems, multi-agent systems, using the JAVA programming language and the OAA framework. Good programming skills and experience in the development of artificial intelligence based computer applications.

11. DEADLINE AND APPLICATION DOCUMENTS

Application period: from June 26 until July 9 2013

Curriculum vitae; graduation diploma; document with courses marks; copy of any previously published works that are relevant for the application evaluation. An application letter with the fellowship reference (ref. **MAN-REM_2013-02**) should be included, indicating clearly the motivation of the application and the full contact information (as minimum: email address, mobile phone number, postal address) of the candidate. All the documents prepared by the candidate for the application should be written in English. Documents should be sent to zav@isep.ipp.pt. Additionally, they should also be sent to the following address:

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A/C Professor Zita Vale
Rua Dr. António Bernardino de Almeida, 431
4200-072 Porto – Portugal

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